

- ✓ *An intensive air conditioning (HVAC) design course*
- ✓ *More than \$25,000 in TAB equipment available for demonstration and use*
- ✓ *Limited enrollment: call 800-462-0876 today!*



Testing, Adjusting and Balancing

**September 15-19, 2003
Madison, Wisconsin**

**April 26-30, 2004
Madison, Wisconsin**



THE UNIVERSITY
of
WISCONSIN
MADISON

COLLEGE of ENGINEERING ■ DEPARTMENT of ENGINEERING PROFESSIONAL DEVELOPMENT

*An intensive state-of-the-art course in
air conditioning (HVAC) design*

Testing, Adjusting and Balancing

**September 15-19, 2003
Madison, Wisconsin**

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- Learn to improve the performance of new and existing air and water systems
- Participate in “how to do it” labs and workshops, with more than \$25,000 in TAB equipment available for demonstration and use



Testing, Adjusting and Balancing

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Save time and money!
Inquire about our on-site courses.
Call 800-462-0876 today!

You Will Learn

Proper maintenance and operation of HVAC air and water systems can reduce operating energy costs and improve the comfort of building occupants. New buildings must be balanced to achieve the design objectives of the consulting engineer, while existing buildings must be rebalanced as needed to acknowledge changes in functional use.

Our intensive five-day course on testing, adjusting and balancing will assist you in the process of checking and adjusting all building environmental systems. You will learn how to

- balance air and water systems
- adjust new and existing systems to provide design quantities
- verify equipment and automatic controls performance
- measure sound and vibration
- estimate costs

For Related Course Descriptions

<http://epdweb.engr.wisc.edu/catalogs/mechanical.lasso>

Featuring “How To Do It” Labs and Workshops

Labs and workshops during this course will stress “how to do it” in a setting where you work on our classroom HVAC demonstration units and existing water systems. More than \$25,000 in TAB equipment will be available for demonstration and use.

Working in small groups, you will apply classroom lectures and material in actual fieldwork. This arrangement will ensure a thorough transfer of knowledge, promote group discussion and provide additional student-instructor interaction.

Who Will Benefit

If your interest is efficient operation of commercial buildings, plan to attend. This course will especially assist

- consulting engineers who need to understand initial and supplemental testing, adjusting, and balancing requirements
- building operating staff seeking in-depth training
- service organizations desiring balancing experience
- contractors interested in operation and service of all building environmental systems

Your Instructors

Darrel J. Hermans PE, president of T&B Services, Ltd., has more than 40 years of experience in controls, balancing and troubleshooting HVAC system problems, from single unit to nuclear power plant ventilation systems. Prior to forming T&B Services, Ltd. in 1980, he was national manager of Fluid Engineering Services (FES), Division of Johnson Controls, Inc. For the past 20 years he has conducted seminars for training personnel in air and water balancing. Mr. Hermans has a BSME from the Milwaukee School of Engineering. He is a registered PE in eight states, a member of ASHRAE and former member of its technical committee for testing and balancing. He is also a member of NEBB, a national organization of testing and balancing agencies.

Charles E. Dorgan PE, program director and professor emeritus, Department of Engineering Professional Development, University of Wisconsin–Madison, has more than 40 years of experience in HVAC&R design and operation.

Valuable Take-home Reference Materials

You will receive an extensive notebook of materials prepared expressly for this course. These materials supplement current published manuals and textbooks.

Limited Enrollment!

Because enrollment is limited to 32, we encourage you to enroll early. Call toll free 800-462-0876 or enroll on-line at <http://epdweb.engr.wisc.edu/webE609>.

Daily Schedule

Registration will be Monday at 8:00 a.m. in The Lowell Center, 610 Langdon Street, Madison, Wisconsin.

Daily lecture/workshop sessions will be from 8:30 to noon and from 1:00 to 4:30. Each day's schedule will include 8:00 coffee, juice, and donuts, midmorning and midafternoon refreshment breaks, and noon lunch Monday through Thursday. On Wednesday, join us for a social hour and dinner at 5:00. The course will adjourn Friday at noon.

Course outline inside...

Testing, Adjusting and Balancing

September 15–19, 2003 ■ April 26–30, 2004 in Madison, Wisconsin

Course Outline

Duct Design

- Air flow theory
- Duct sizing
- Pressure, pressure loss, and measurement

Psychrometrics

- Properties of dry air and water vapor
- Latent, sensible and combination processes
- Humidifying and dehumidifying
- Use of psychrometric chart

Testing and Measurement

- Instruments and use
 - manometers and pitot tubes
 - rotating vane
 - swing vane (Alnor velometers)
 - hot wire anemometers
 - balancing hoods
 - flow measuring stations
 - tachometers
 - thermometers
- Measurement of flow
 - selection of traverse and test points
 - temperature and altitude corrections

Instrument Lab (Optional)

A hands-on opportunity to use and evaluate air/water system TAB instruments

Calculator Helpful!

Please bring a calculator with exponent and memory functions.

Fans

- Types
- Performance characteristics: arrangements, noise
- Proper selection: fan and system curves, fan laws
- Installation practices: inlet and outlet, drive arrangements
- System effect factor
- Testing

Systems and Terminal Units

- Types
- Measurement and adjustment

Automatic Temperature Controls

- Types
- Control techniques
- Relationship to balancing
- Adjusting terminal unit controls

Electric Motors

- Type and application
- Motor performance evaluation
- Troubleshooting
- Safety

Air Balance Lab

Small groups of students will test, adjust and balance an HVAC system and prepare a balance report based on course labwork.

- Preliminary procedures
- Forms
- On-the-job procedures
- Presentations and critique

Ducts and Controls

- HVAC duct systems
- Flow measurement and control locations

Water Systems and Pumps

- Types and design
- Equipment room piping practice
- Pump applications and selection: pump/system curves, closed/open systems, pump efficiency
- Testing

Water System Balancing

- Flow measurement devices
- Flow balance procedures

Water Balance Lab

Small groups of students will test an existing hot water/chilled water system and prepare a balance report based on course fieldwork.

- Preliminary procedures
- Forms
- On-the-job procedures
- Presentations and critique

Troubleshooting Existing Air and Water Systems

- Finding obstructions and leaks
- Poor distribution
- Flow measurement
- Evaluating fan/pump size and motor size

Sound and Vibration in Systems

Cost Estimating Techniques

- Variables and task requirements
- Estimating procedures

Miscellaneous Topics

- Certification
- Commissioning
- Commissioning process

HVAC Course Series

The *Testing, Adjusting and Balancing* course is part of our comprehensive course series on air-conditioning design. The courses focus on the latest information and advances in the field so that you can return to your job with up-to-date knowledge and ideas that you can apply immediately. If you would like information on the other courses in this series, contact program director Charles Dorgan by calling toll free 800-462-0876, send an e-mail to cedorgan@wisc.edu, or check our Web site at <http://epdweb.engr.wisc.edu/catalogs/mechanical.lasso>

On-site Courses Save Time & Money!

Engineering Professional Development can offer many of its courses:

- At a location of your choice
- At your convenience
- At reduced per-person cost
- Tailored to your needs

To inquire about courses that we can bring to your site, including optimal group size and costs, or to request an on-site course, call 800-462-0876. Or see <http://epdweb.engr.wisc.edu/onsite>

Upcoming Courses

The Commissioning Process for Delivering Quality Constructed Projects

The Commissioning Process for Building Assemblies and Systems

Certification Training for Accredited Commissioning Process Provider, and Examination

April 26–May 1, 2004, Madison, WI
Courses #F610/F611/F612

HVAC for Industrial Facilities

June 7–11, 2004, Madison, WI
Course #F582

DDC Controls

July 19–23, 2004, Madison, WI
Course #F613

Cogeneration Technology

August 23–27, 2004, Madison, WI
Course #F614

Psychrometric Processes and Load Calculations

September 13–17, 2004, Madison, WI
Course #F618

Four Easy Ways to Enroll

Need to Know More?

Call toll free 800-462-0876 and ask for

Program Director: Charles E. Dorgan
cedorgan@wisc.edu

Program Assistant: Mary Danielson
Or e-mail custserv@epd.engr.wisc.edu

General Information

Fee Covers Notebook, course materials, break refreshments, four lunches, one scheduled dinner and certificate.

Cancellation If you cannot attend, please notify us at least 7 days prior to the first day of the course, and we will refund your fee. Cancellations received after this date and no-shows are subject to a \$150 administrative fee. You may enroll a substitute at any time before the course starts.

Location The Lowell Center, 610 Langdon Street, Madison, Wisconsin. If you must be contacted during the course, phone messages may be left for you at 608-256-2621.

Accommodations A block of rooms for course participants has been reserved at The Lowell Center, the course site. The room rate is \$70/single and \$80/double, including breakfast. Call 866-301-1753 or 608-256-2621 and identify yourself as a participant in the University of Wisconsin "Testing, Adjusting and Balancing" course. Please make your reservations no later than four weeks prior to the course. You will receive other hotel/motel information with your enrollment confirmation.



Phone:
800-462-0876 or
608-262-1299 (TDD 265-2370)



Internet:
<http://epdweb.engr.wisc.edu/webF609>

Mail to:

Engineering Registration, The Pyle Center
702 Langdon Street, Dept. 108
Madison, Wisconsin 53706



Fax:

800-442-4214 or 608-265-3448



Course Information

Please enroll me in **Testing, Adjusting and Balancing**

☐ **Course #E666** September 15–19, 2003 in Madison, WI Fee: \$1345

☐ **Course #F609** April 26–30, 2004 in Madison, WI Fee: \$1345

☐ I cannot attend at this time. Please send me brochures on future courses.

Enrollment limited to 32

Personal Information (Please print clearly.)

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone (_____) _____ Fax (_____) _____

E-mail _____

Additional Enrollee

Name _____

Title _____

E-mail _____

Billing Information

☐ Bill my company ☐ P.O. or check enclosed (Payable in U.S. funds to UW–Madison)

☐  ☐  ☐ 

Cardholder's Name _____

Card No. _____ Expires _____

UW#



Important—please enter the 3-digit UW# Code from the mailing label.

☐ Please check the box if you are a person with a disability and desire special accommodations. A customer service representative will contact you. Requests will be kept confidential.